PROGRESS REPORT
JULY 15, 1999
ALTERNATIVE PRACTICES FOR REDUCING PESTICIDE IMPACTS ON WATER QUALITY
CONTRACT #B-81609

This report summarizes activities and accomplishments since our last progress report on April 15, 1999. Task Orders for Year 1 of the contract are presented together with "REPORT" sections on the status of each task.

TASK ORDERS
October 1, 1998 – September 30, 1999 (Year 1)
Contract No. B81609

TASK I – MATRIX OF INFORMATION SYNTHESIS – Year 1

Compile the current knowledge of urban and in-season agricultural (stonefruit and almond production) pest management practices that are alternatives to diazinon and chlorpyrifos. Currently fragmented information on these alternatives will be compiled from scientific journals, research reports, and unpublished (anecdotal) investigations primarily found at the U.C. Cooperative Extension county level of ongoing applied research. From the compiled knowledge, produce an information synthesis document, the Alternative Practices Matrix, that will display a comprehensive set of interactive variables relative to alternative practice economics, efficacy, and environmental impact potentials.

Subtask 1. P.I.s will recruit and hire a research assistant with sufficient technical expertise in pest management and aquatic toxicology and demonstrated writing skills. Estimated duration for this task is 2 months beginning October 1, 1998.
Subtask 2. Research assistant will begin compiling information on urban and in-season agricultural (stonefruit and almond production) uses of chlorpyrifos and diazinon.
Subtask 3. Research assistant and P.I.s will identify the uses that suggest the highest potential for impacting surface waters due to their being consistent with observations of seasonal increases in aquatic areas within the CALFED geographic scope. Estimated duration for this task is 6 months.
Subtask 4. Research assistant will begin compiling the literature that addresses alternatives to chlorpyrifos and diazinon for the uses identified in Subtask #3. This task is estimated to begin April 1, 1999 and continue into Year 2.
Subtask 5. Project manager and P.I.s prepare and submit progress reports.

REPORT: During the last quarter Pattie Gouveia has been spending most of her time compiling the in-season matrix for in-season pest management practices that are alternatives for chlorpyrifos and diazinon; she has researched data and added to the alternative procedures matrix for the following pests: ants and NOW (navel orange worm) in almonds; OFM (oriental fruit moth) in prunes and peaches; PTB (peach twig borer) in almonds, apricots, peaches, plum, prunes; SJS (San Jose scale) in peach, plum and prunes.

Pattie has also begun to attend meetings with the Urban Pesticide Group and the Sacramento River Watershed Program Focus Group. Both these groups have been working on the problem of urban pesticide use. A good flow of information to and from these groups will be extremely valuable to the development of the urban alternatives matrix.

We estimate the Year 1 goal for Task 1 to be 65% complete.

TASK 2 – ALTERNATIVE PRACTICES EDUCATION AND OUTREACH – Year 1

Programs will be developed to provide agricultural producers (stonefruit and almonds) with a detailed assessment of the current knowledge of water quality problems associated with pesticide use while offering substantive alternatives. For urban users of diazinon and chlorpyrifos, the education and outreach component of the project will define the main urban uses of diazinon and chlorpyrifos, establish the most appropriate priority of audiences to address, and identify the most appropriate means of gaining access to these audiences.

The following subtasks generally describe the approach and sequence of work on behalf of both the agricultural and urban components of this project.

Subtask 1. Recruit and hire a county-based (Cooperative Extension) research assistant and a rural sociologist to interact with the P.I.s and Cooperative Extension personnel in the case study area (Modesto region). Estimated duration for this task is 2 months beginning October 1, 1998.
Subtask 2. CE research assistant will begin developing baseline information on current pesticide use practices within the case study area. Estimated to begin December 1, 1998.
Subtask 3. Sociologist will develop questionnaire materials that will allow for measures of the influence education and outreach efforts have on adoption of alternative practices.
Subtask 4. CE research assistant, P.I.s, and project manager will identify local, regional, and state agencies and organizations that are stakeholders in urban and in-season agricultural uses of chlorpyrifos and diazinon.
Subtask 5. CE research assistant, P.I.s, and project manager will create or interact with existing advisory committees involved with education and outreach to the major urban and in-season users of chlorpyrifos and diazinon.
Subtask 6. CE research assistant, P.I.s, and project manager will establish the most appropriate priority of audiences for directing educational and outreach efforts (e.g. licensed applicators, wholesale/retail nursery distributors, residential users, crop associations). This task is estimated to begin January 1, 1999.
Subtask 7. CE research assistant, sociologist, P.I.s, and project manager will identify the most appropriate means of gaining access to the audiences identified in Subtask #6.
Subtask 8. CE research assistant, P.I.s, and project manager will develop educational materials appropriate for the focal audiences. Sophistication of educational materials will be consistent with the scope of the budget for this project.
Subtask 9. The products of Tasks 6-8 will be submitted to the steering committee and CALFED for review and comment.
Subtask 10. CE research assistant, P.I.s, and project manager will begin implementing education and outreach efforts. This task is estimated to begin February 1, 1999 and continue into Year 2.
Subtask 11. Project manager and P.I.s prepare and submit progress reports.

REPORT: Dr. Zalom has continued to have frequent interactions with a variety of stakeholder groups (in particular, the Pest Management Alliance groups) who are also attempting to increase awareness of issues involving pesticide impacts on water quality. Some of these groups are also funded to do field demonstration and research projects, and we are looking for ways to better interact with their efforts in order to achieve a higher level of combined accomplishments.

Because we were unable to recruit a suitable replacement for our CE research assistant, we have been delayed in making any noteworthy accomplishments in our county-based tasks. The next quarter will see this situation reversed as a result of the Project Manager assuming these duties in addition to his existing responsibilities.

We estimate Task 2 to be 45-50% complete for Year 1.

TASK 3 – FIELD STUDIES OF ALTERNATIVE PRACTICES – Year 1

Develop a master protocol for monitoring studies that will clearly identify the criteria for selecting a site to simultaneously study the efficacy of an alternative practice relative to pest control and improving water quality. Year 1 efforts will focus primarily on alternatives to dormant sprays. Select study sites and initiate field studies. Water quality monitoring will determine whether reduction of offsite pesticide movement follows adoption of alternative practices, and whether toxicity to test organisms is also diminished. Pest control monitoring will compare efficacy of diazinon and chlorpyrifos with alternative treatments for control of peach twig borer and scale insects in replicated field trials where the toxicology monitoring will also be conducted. Additionally, develop resident species bioassays as alternatives to the standard EPA test organisms.

Subtask 1. CE research assistant and P.I.s will prepare a draft master protocol that identifies the criteria for selecting sites for studying dormant spray alternative practices relative to pest management efficacy and impacts on surface water quality (e.g. type of irrigation supply, mode of water application, crop, design of hydrology of field for irrigation purposes, slope of land, soil type, surrounding vegetation, and relationship to surface waters). Additionally, the protocol will define the parameters to be controlled, parameters to be measured or described, the methodology of measurement, and the analytical processes for data production and evaluation. This task is estimated to begin October 1, 1998 and reach full refinement by July 31, 1999 following peer reviews as described below.
Subtask 2. CE research assistant and P.I.s will meet with Cooperative Extension advisors and growers to identify and select areas with history of appropriate pest incidence and consistent with the master protocol criteria for field studies. This task is estimated to begin December 1, 1998 and be finalized with the completion of task #3 by January 1, 1999 for dormant alternative studies.
Subtask 3. Submit draft master protocol and proposed study sites to project steering committee and the CALFED monitoring group for review.
Subtask 4. CE research assistant and P.I.s will refine draft master protocol and site selections according to recommendations of steering committee. The draft master protocol and site selections will also be given to the CALFED monitoring group for their review. This task is estimated to be completed by January 1, 1999.
Subtask 5. Survey proposed sites pre-treatment to establish initial presence of target pests as the final site selection criteria.
Subtask 6. For the purpose of establishing baseline data, CE research assistant and toxicology lab personnel collect water samples from proposed study sites and perform bioassays and chemical detection for definition of pre-alternative pesticide status. Siting and replication of sampling will be consistent with the master protocol. Two of the standardized US EPA test organisms will be used: the fathead minnow (*Pimephales promelas)* and the water flea (*Ceriodaphnia dubia*). In addition, highly selective analytical chemistry and toxicology endpoints will be used to determine presence and concentration of specific agents. To establish number of toxic units present in the sample, dilution tests will be used.
Subtask 7. CE research assistant and growers initiate treatment of field study sites. Replicated treatments may consist of the target organophosphates, alternative conventional pesticides (carbamates, pyrethroids including Ambush and Asana), microbial or other biologically-based pesticides that are generally regarded as "safe" (for example *Bacillus thuringiensis,* Spinosad and pheromones), in season (rather than dormant season) applications of these materials, and reduced rates of application.
Subtask 8. CE research assistant and P.I. begin monitoring pest incidence and damage in each treatment replicate after treatments have been established. Monitor peach twig borer shoot strikes and fruit damage at harvest. Monitor San Jose scale males with pheromone traps and scale populations on wood and fruit.
Subtask 9. CE research assistant and toxicology lab personnel collect water samples from study sites according to master protocol and perform bioassays and chemical detection for pesticide levels.
Subtask 10. Recognizing that chronic bioassays need to be developed which will use indigenous species that can ultimately be related to the three US EPA standard organisms, toxicology lab personnel will select candidate organisms on the basis of their role in the food web of CALFED-identified, endangered, and/or listed fish species. They will collect organisms and establish cultures of 4 resident food web organisms. Estimated to begin August 1, 1998 and be completed by February 1, 1999.
Subtask 11. Toxicology lab personnel will conduct bioassays with native food web organisms (a. benthic midge *Chironomus sp.*; b. cyclopoid copepod; c. cladoceran *Bosmina sp.*; and, d. amphipod (*Corophium sp.).* Rank order as to sensitivity and select one sensitive and one moderately sensitive species for bioassays. Estimated to begin January 1, 1999 and continue into the early part of year 2.

Subtask 12. Toxicology lab personnel will initiate studies and evaluate resident species for use in Toxicant Identification Evaluations. Estimated to begin June 1, 1999 continue into year two as necessary.

REPORT: The primary activity this last quarter that relates to field studies is the continuation of laboratory preparations being made to allow us to handle the large number of field samples we anticipate generating this coming winter. As mentioned in our last report, methodologies for Solid Phase Extraction (SPE) of diazinon from water and GC analysis are being further evaluated and are proving to be effective. GC conditions for esfenvalerate analysis have been further refined, and greater sensitivity in detecting esfenvalerate is being achieved by the upgrading of our existing equipment with the addition of a new Electron Capture Detector (ECD). Please note that the ECD is actually an add-on to existing equipment in Barry Wilson's lab. The university is classifying it as equipment because it is attached to an existing piece of property that UC owns, but CALFED may choose to view this as an expendable supply item.

We have validated the esfenvalerate extraction and analysis, but one last step needs to be worked out before we can begin running the samples already in hand. We have to get the sediment out of our samples because we are interested in what is bioavailable in the water rather than what is bound in the sediment. In the past, the Aquatic Toxicology lab has centrifuged some of their samples to eliminate sediment, but the size and number of samples currently waiting to be analyzed isn't conducive to centrifugation. Therefore, we're trying a filtration step. We are presently looking at drawing the sample through a filter before it goes on to the Solid Phase Extraction Column. If it goes smoothly (filter doesn't get too clogged and recovery is still good), it will significantly reduce the processing time.

The anticipated summary of total numbers and types of samples collected along with the results of toxicity assays already done (approximately 50) as well as analyses still pending (approximately 200) is not available for this report because samples have still not been analyzed. The host of minor complications encountered in refining the laboratory procedures is responsible for this being delayed.

We met June 2nd and are meeting again July 19th to discuss and calculate the number and types of samples that we will be generating and analyzing this coming winter. Variables influencing these calculations will include current laboratory costs, labor availability, and limitations associated with budget as well as availability of producer cooperators and field sites.

As mentioned in the last report, we are continuing with development of the alternative test organisms primarily by refining culture techniques for the candidate organisms. (subtasks 10-12)

We estimate Task 3 to be 60-65% complete for Year 1.

BUDGET: The following page is a summary of our budget expenditures, variances, and balances through the third quarter of the project.